

The National Drought Mitigation Center's Drought Risk Atlas (DRA)

**Brian Fuchs
National Drought Mitigation Center
University of Nebraska-Lincoln
School of Natural Resources**



North American Drought Monitor Forum
May 1-3, 2018
Calgary, Alberta, Canada

Historical Drought Data

Understanding what has happened in the past is valuable in understanding current drought events

**Svoboda, M. , Fuchs, B., Poulsen, C., Nothwehr, J., 2015. The Drought Risk Atlas: Enhancing Decision Support for Drought Risk Management in the United States. J.Hydrology, 526, 274-286.
doi: 10.1016/j.jhydrol.2015.01.006**

The Drought Risk Atlas
will answer the following
questions for users
through the data and
products available within
the tool:



How does the current drought compare historically?



How often does a drought of this magnitude happen
(frequency)?

When was the last time a drought like this happened?

What is the likelihood of the drought continuing?

What did the spatial footprint of the last drought look like?



Drought Risk Atlas Initial Station Screening Criteria

- ❖ Station currently open and taking observations
- ❖ At least 40 years of data available
- ❖ No more than 2 consecutive months missing at any time during the established period of record
- ❖ A unique period of record was established for each station to calculate drought indices



National Drought Mitigation Center

Drought Risk Atlas

droughtatlas.unl.edu



[Home](#)
[Map Viewer](#)
[Data](#)
[Methodology](#)
[About](#)
[Help](#)


13

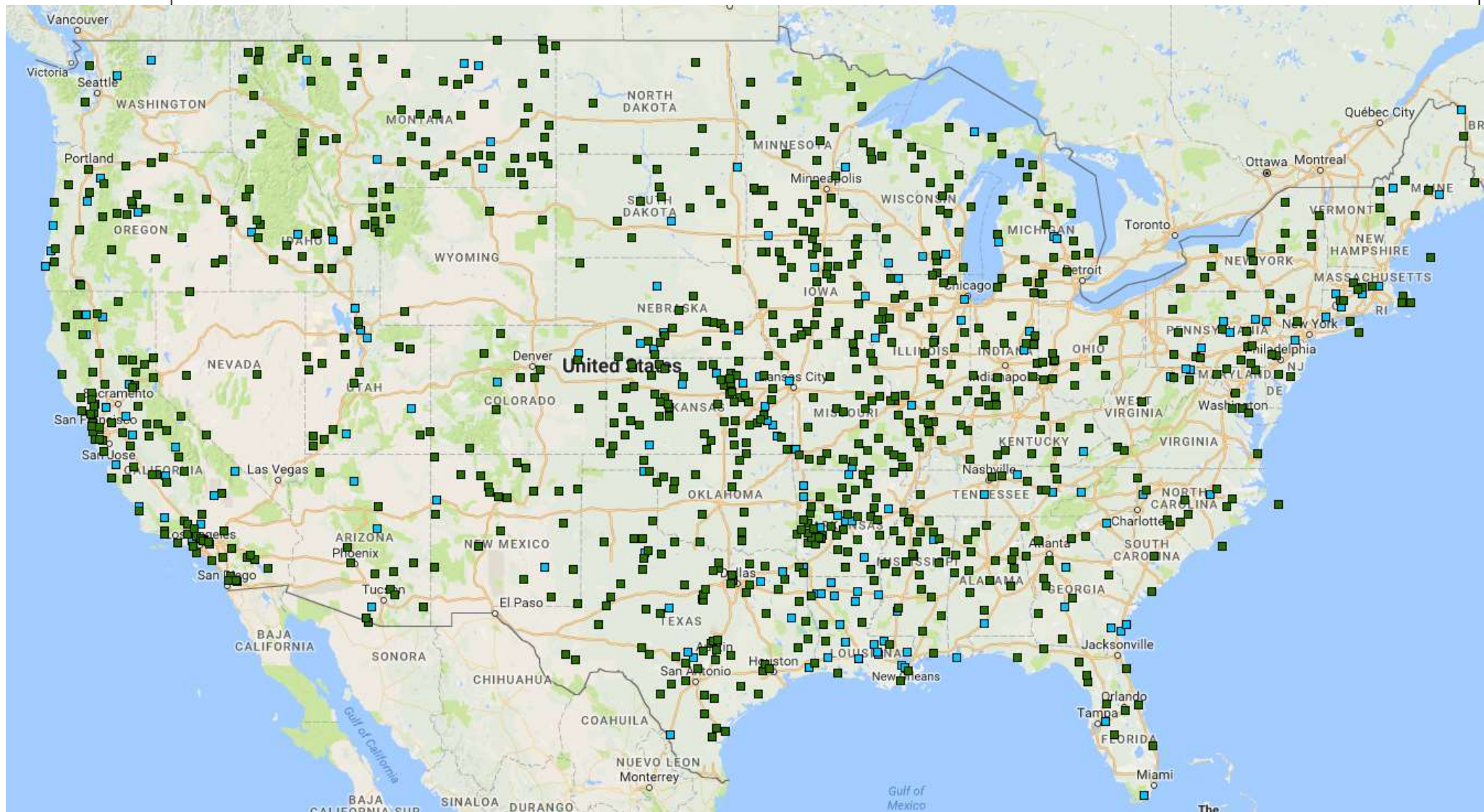
Current Location » Home

Stations used in the Drought Risk Atlas

The idea of updating from the original Drought Severity Index (DSI) of the United States Army Corps of Engineers in the 1990s. The original Climate Network (HCN) of record at the time of the 1940s to present, climate divisions, and Drought Severity Index climatological data to use this tool to make better decisions. For the new nation both in the number of the most complete HCN. Using a weekly station location, not representation of (SPI), Standardize Drought Severity Index other climatological with the climatological available for the entire

- cy
it

Stations with 40 Plus Years of Data



3059 Stations Total

Drought Risk Atlas Update Screening Criteria

- ❖ Station currently open and taking observations
- ❖ At least 40 years of data available
- ❖ Data gaps were less than 2 consecutive years at any time in the stations record
- ❖ Station had 5 data gaps or less in the last 40 years
- ❖ A unique period of record was established for each station to calculate drought indices
 - **NOTE:** Event reporters were not considered as gaps in the data

2016-2017 Drought Risk Atlas Update

- ❖ More stations were included by using a less restrictive criteria
 - ❖ 3,797 COOP stations were analyzed for all of the U.S.
 - ❖ 223 additional stations meeting **original criteria**
 - ❖ 910 new stations chosen to be included using the **new criteria**
 - ❖ 434 long-term SNOTEL stations chosen to be included
 - ❖ Alaska and Hawaii stations identified
 - ❖ 4,626 stations will be included in the update of the Drought Risk Atlas in (COOP and SNOTEL)
 - ❖ 52% more stations will be included during the update

COOP Station Comparisons

Original Drought Risk Atlas Station Inventory

Total Number of Stations: 3,059	Number	Percent
Stations with 50+ years data	2462	81.0%
Stations with 60+ years data	1733	57.0%
Stations with 70+ years data	1170	38.5%
Stations with 80+ years data	827	27.2%
Stations with 90+ years data	537	17.7%
Stations with 100+ years data	349	11.5%

Updated Drought Risk Atlas Station Inventory

Total Number of Stations: 4,192	Number	Percent
Stations with 50+ years data	3861	92.1%
Stations with 60+ years data	3218	76.8%
Stations with 70+ years data	2113	50.4%
Stations with 80+ years data	1400	33.4%
Stations with 90+ years data	1060	25.3%
Stations with 100+ years data	720	17.2%
Stations with 110+ years data	453	10.8%
Stations with 120+ years data	229	5.5%
Stations with 130+ years data	16	0.4%

Multiple options within the user interface allows for the selection of historical drought information

Data

Selected Atlas Station: none selected

Use one of the options to select a station.

Close [x]

By State

Nebraska

Search

By Station Name

Enter the station name or COOP ID

Search

By Location

Enter a latitude and longitude (in decimal degrees) or click on the map.

Latitude

Longitude

Search Radius

25

▼ (miles)

Search

Station Map



Dataset

☐ Raw Data

Serially Complete

Note: The PDSI and Self-calibrated PDSI are only available for the Serially Complete dataset.

Station List

Select a station from the list below or from the map.
After making your selection, click Update selection to
view Atlas data.

250030: AGATE 3 E

250050: AINSWORTH

250245: ANSELMO 2 SE

250365: ARTHUR

250375: ASHLAND 2

250420: ATKINSON 3500

250435: AUBURN 5 ESE

250445: AURORA

250640: BEAVER CITY

Indices are computed for each station

- Similar stations are identified through the results of a cluster analysis where 139 unique climate regimes were identified for the United States
- Complete metadata for each station is available along with other climatic information, not just drought information
- Data can be downloaded by the users

Home Map Viewer Data Methodology About Help

Station Climate Deciles SPI SPEI PDSI SC-PDSI Drought Monitor Drought Periods Compare Indices Frequencies

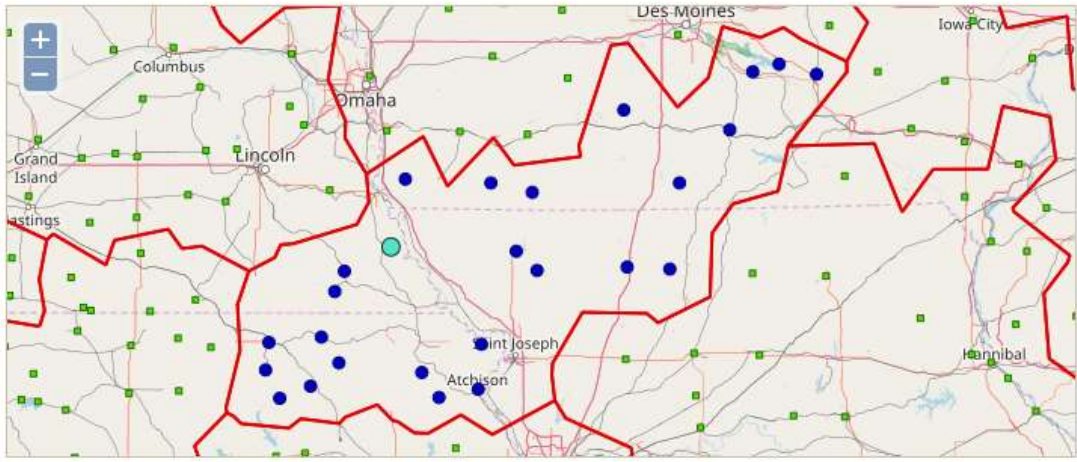
250435: AUBURN 5 ESE
Latitude 40.37
Longitude -95.747
Elevation (ft) 930
State Nebraska
County Nemaha
Climate Division 9
Time Period 1/1/1908 - 12/31/2016
Years on Record 108
Precipitation Only No

Download Metadata

The Atlas period of record can and will vary from the ACIS period of record. Stations may have had data periods that did not meet the criteria used in the Atlas. Those data periods are not included here. [More information](#)

Similar Stations

Atlas Region



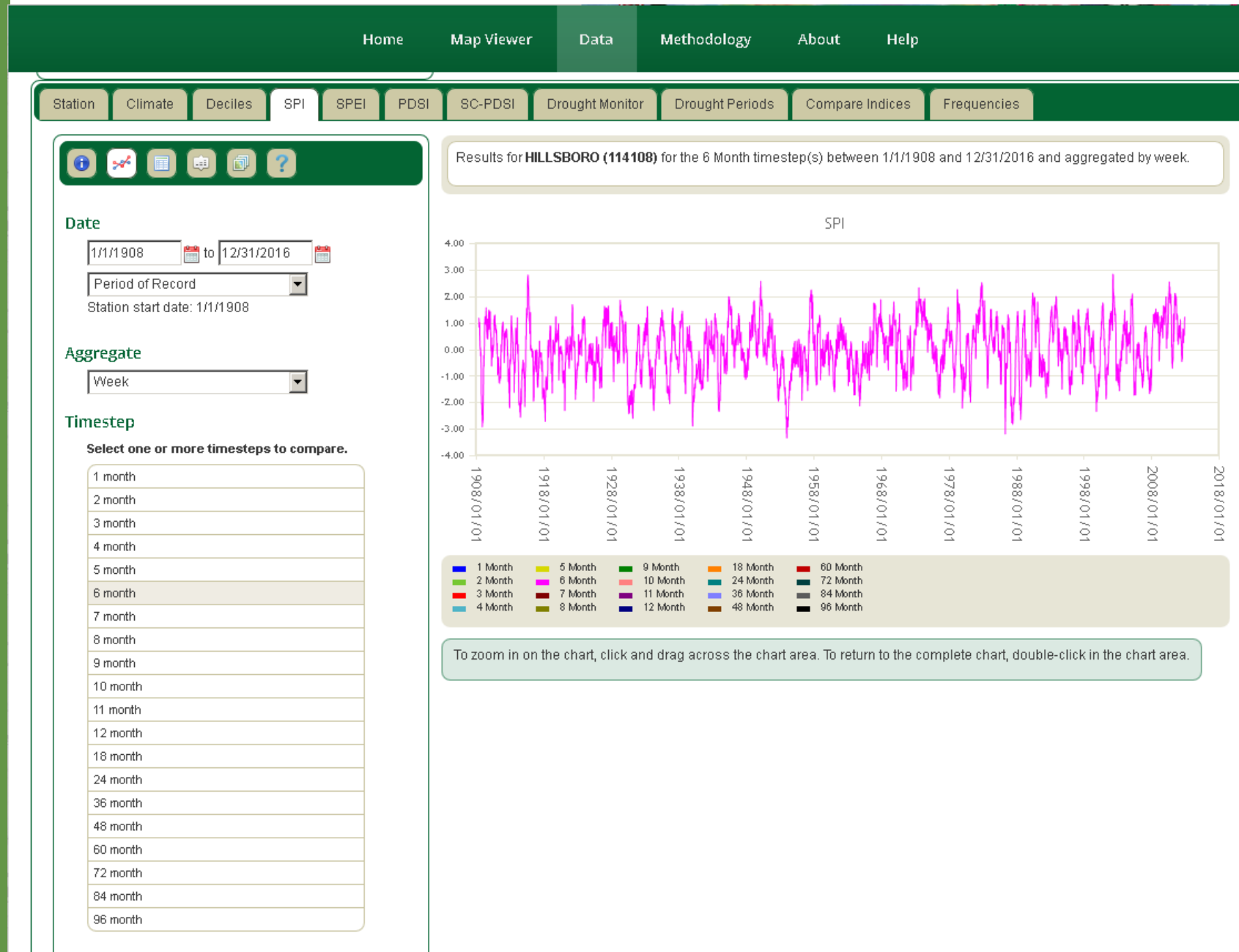
Related Stations:

(Click to select)

130576: BEDFORD
131394: CHARITON 1 E
131533: CLARINDA
134502: KNOXVILLE
134758: LEON 6 ESE
134926: LORIMOR
136327: OSKALOOSA
136527: PELLA 1S

Options in the Drought Risk Atlas include:

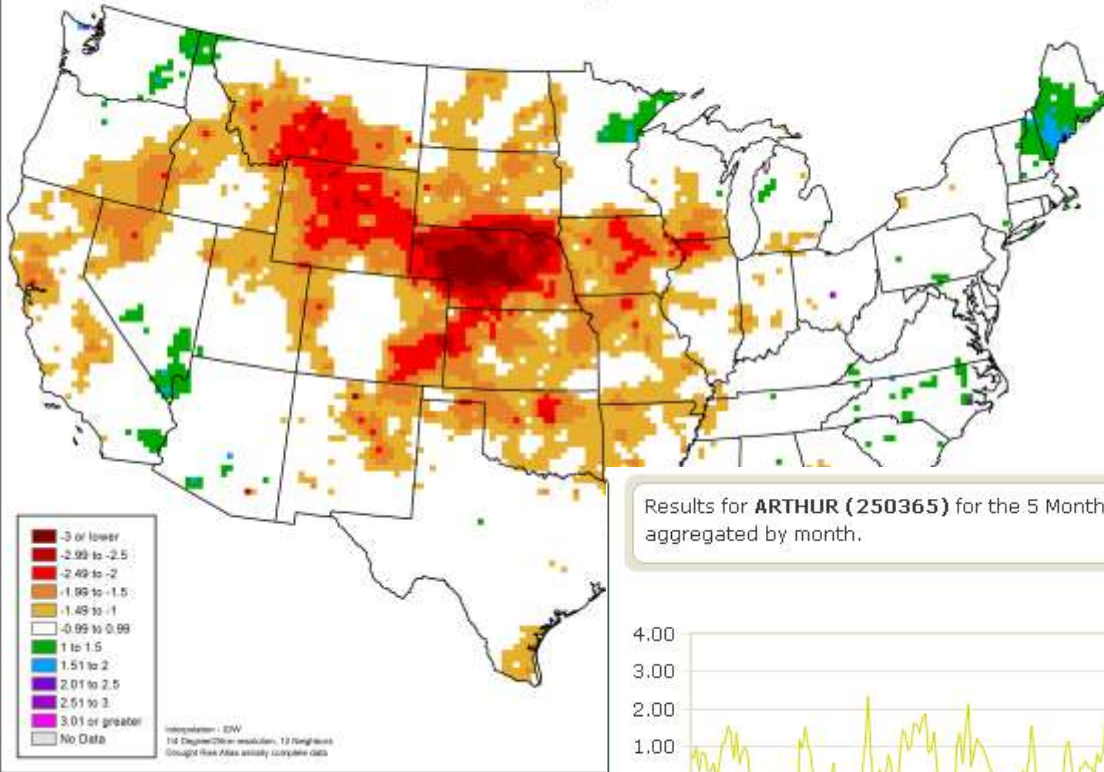
- ✓ SPI
- ✓ SPEI
- ✓ PDSI
- ✓ sc-PDSI
- ✓ USDM
- ✓ Drought Periods
- ✓ Comparison of Indices
- ✓ Frequencies
- ✓ Mapping



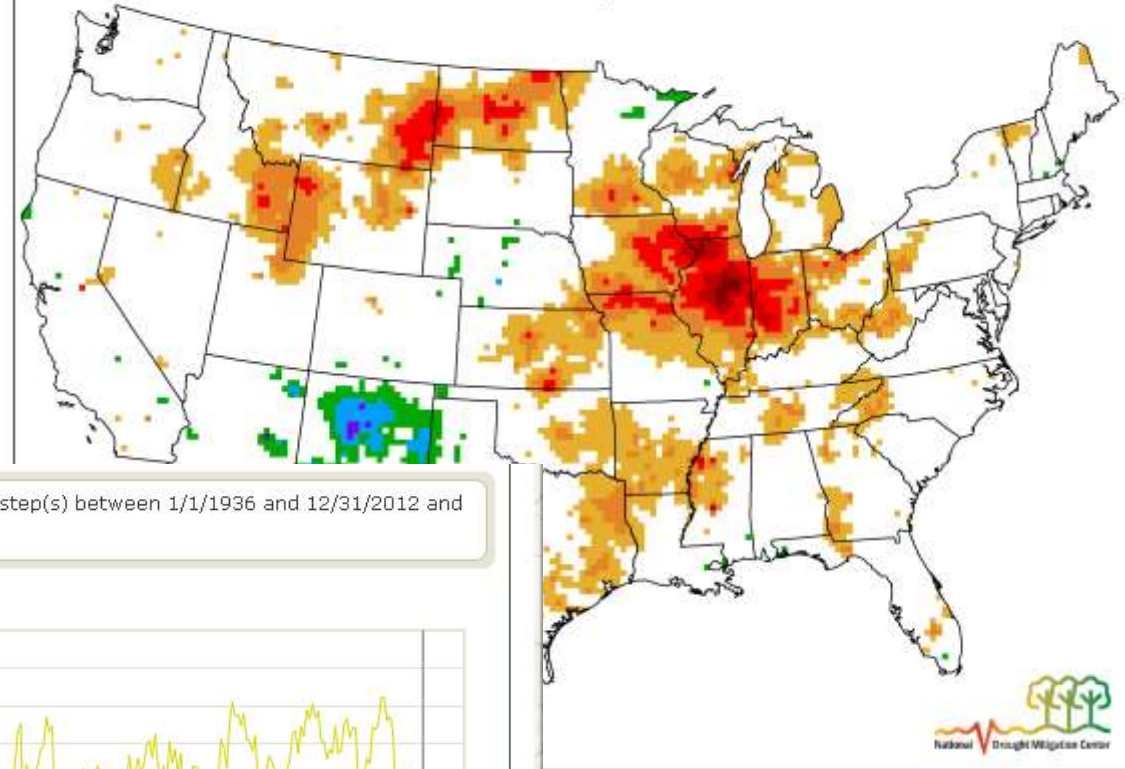
Comparing Drought Periods

How did drought look in 1988 vs 2012?

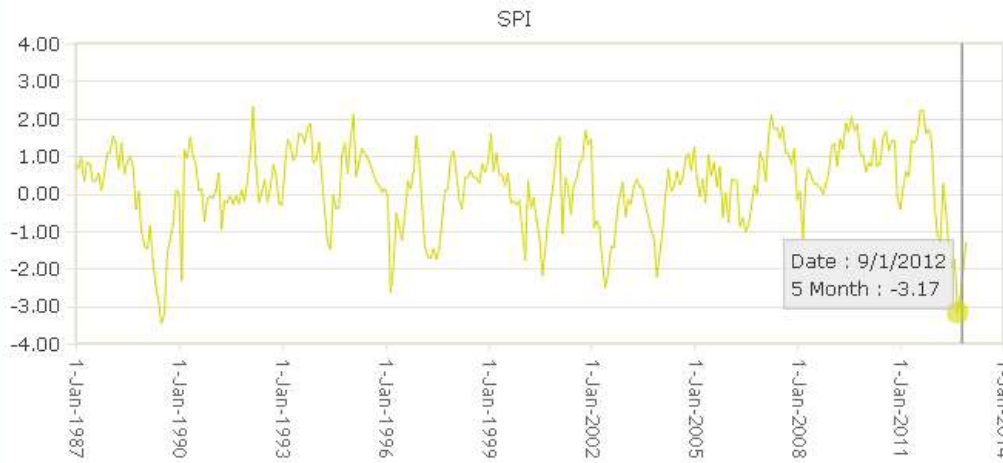
5 Month SPI for September 2012



5 Month SPI for September 1988



Results for **ARTHUR (250365)** for the 5 Month timestep(s) between 1/1/1936 and 12/31/2012 and aggregated by month.

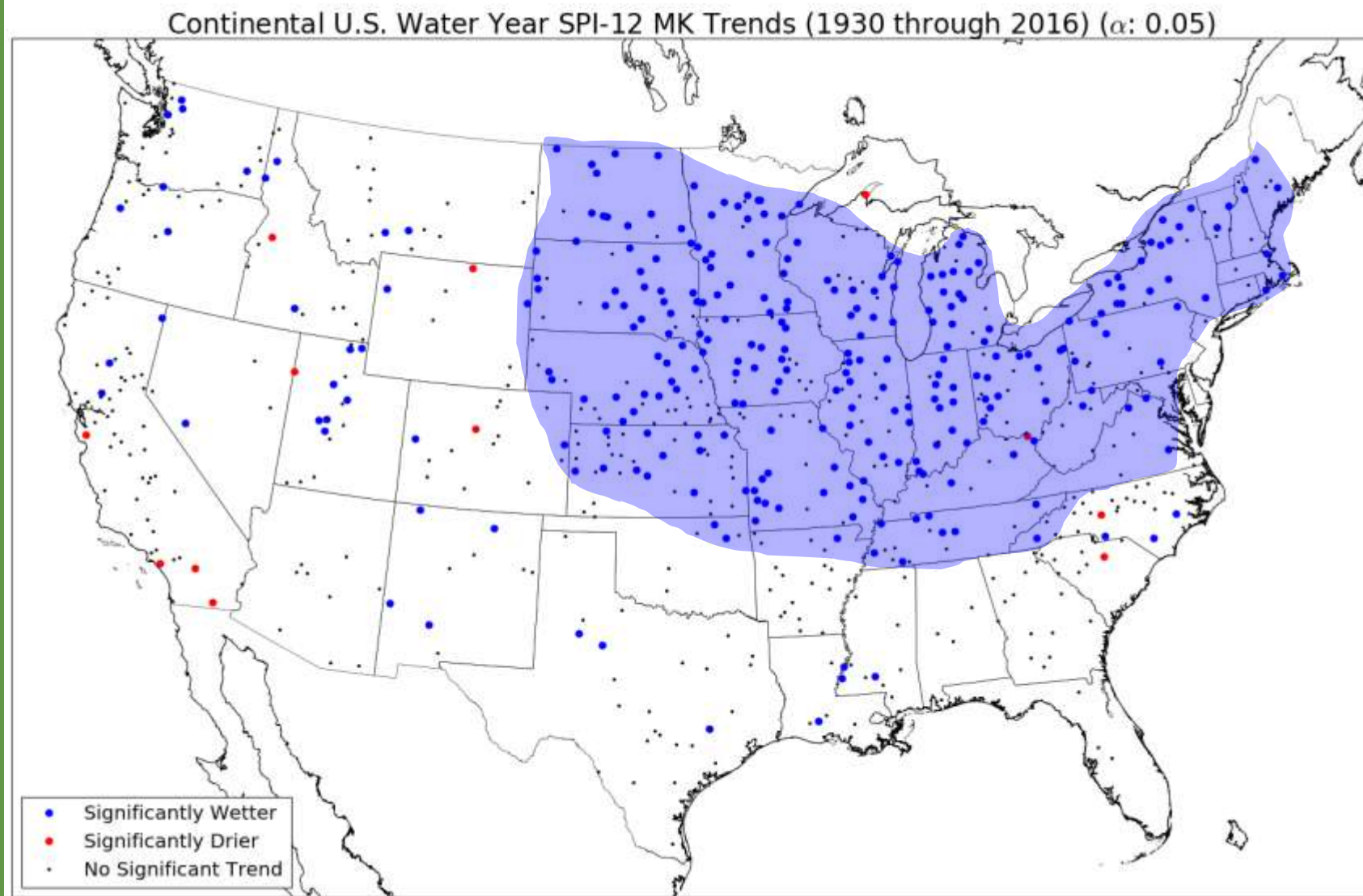


Trend analysis work: Preliminary Results

Slides on trend analysis courtesy of Curtis Riganti
NDMC Climatologist

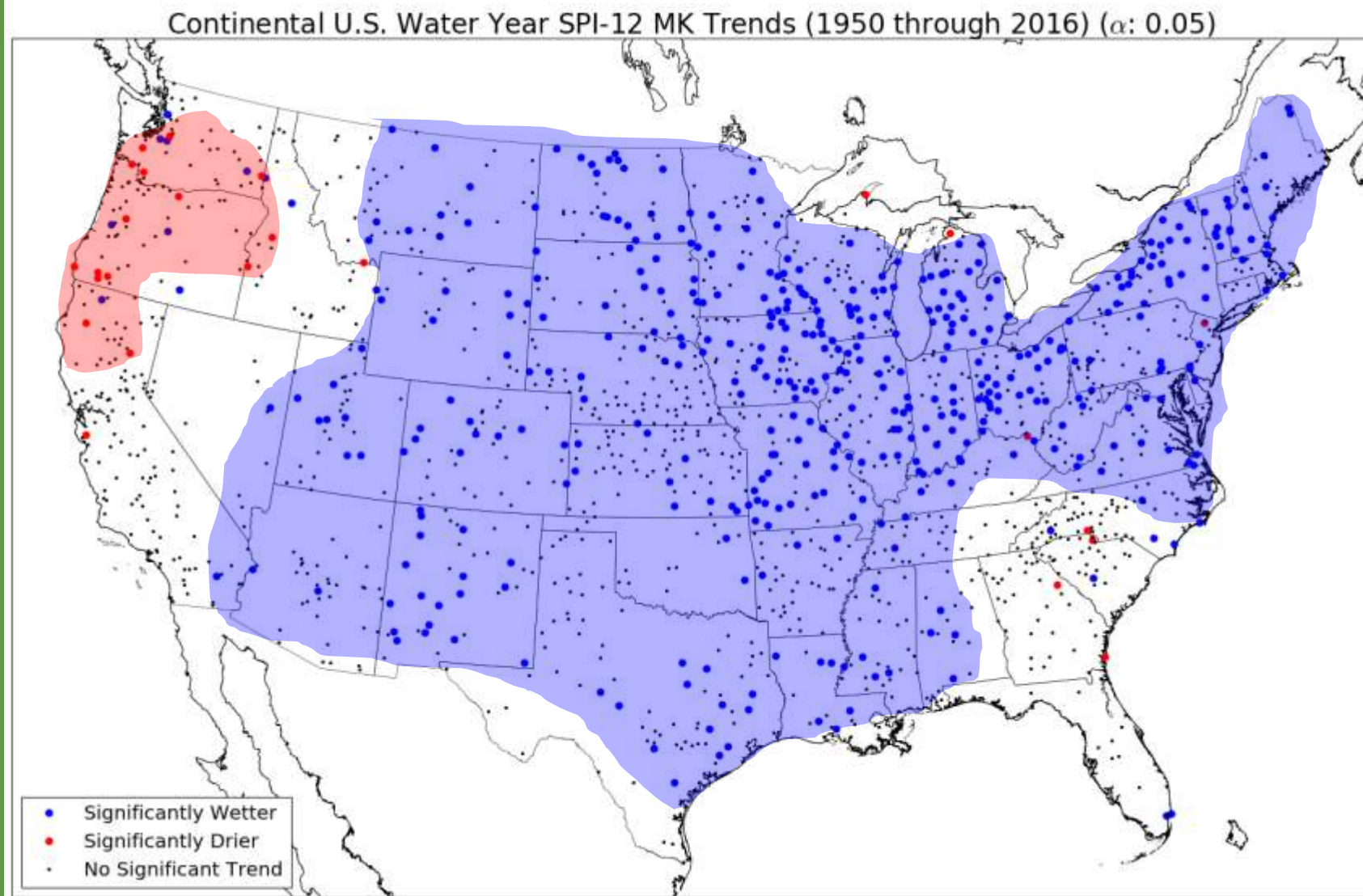
SPI-12 Water Year Trends 1930-2016

Two-tailed Mann-Kendall
Test, $\alpha = 0.05$



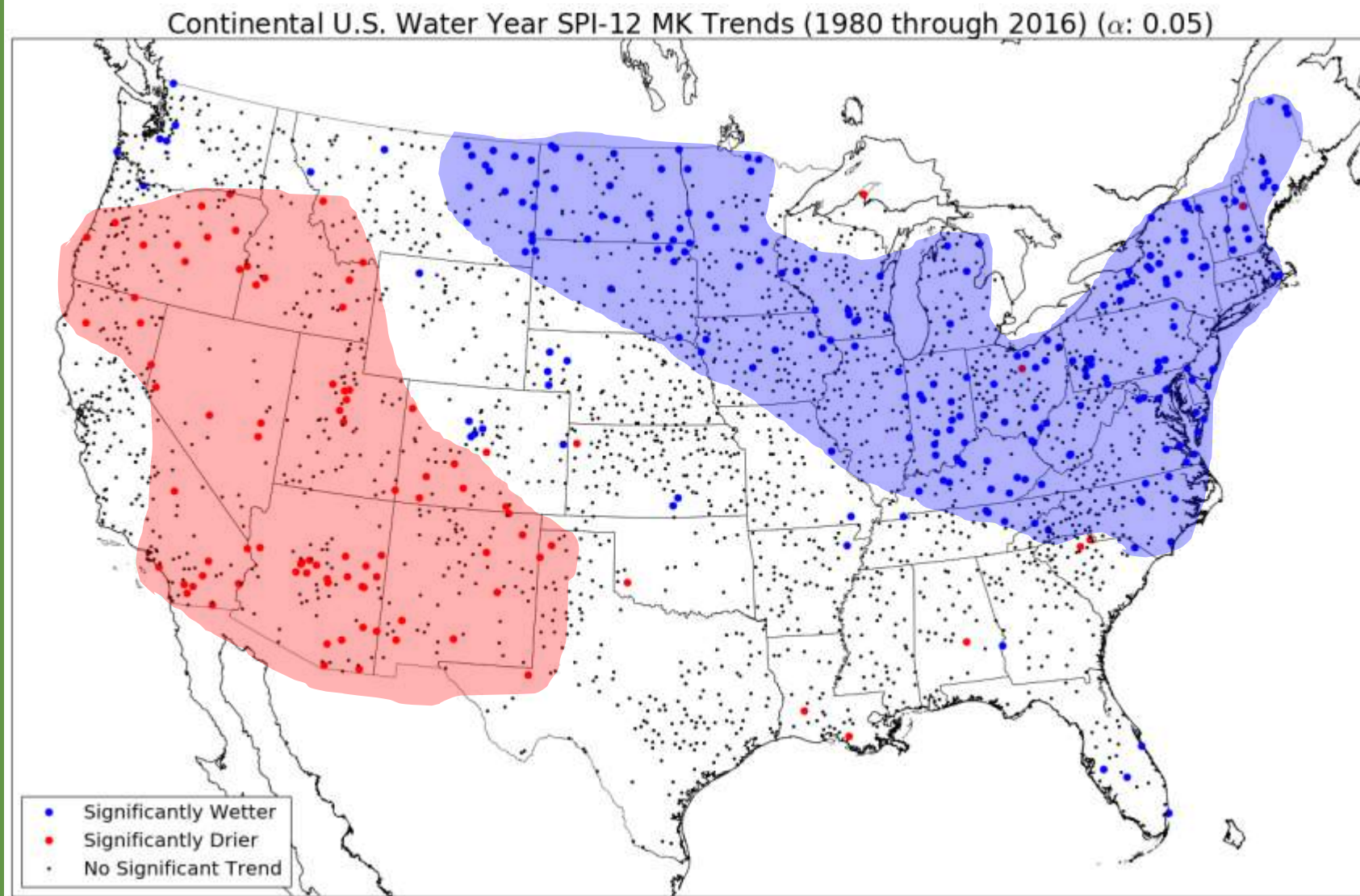
SPI-12 Water Year Trends 1950-2016

Two-tailed Mann-Kendall
Test, $\alpha = 0.05$



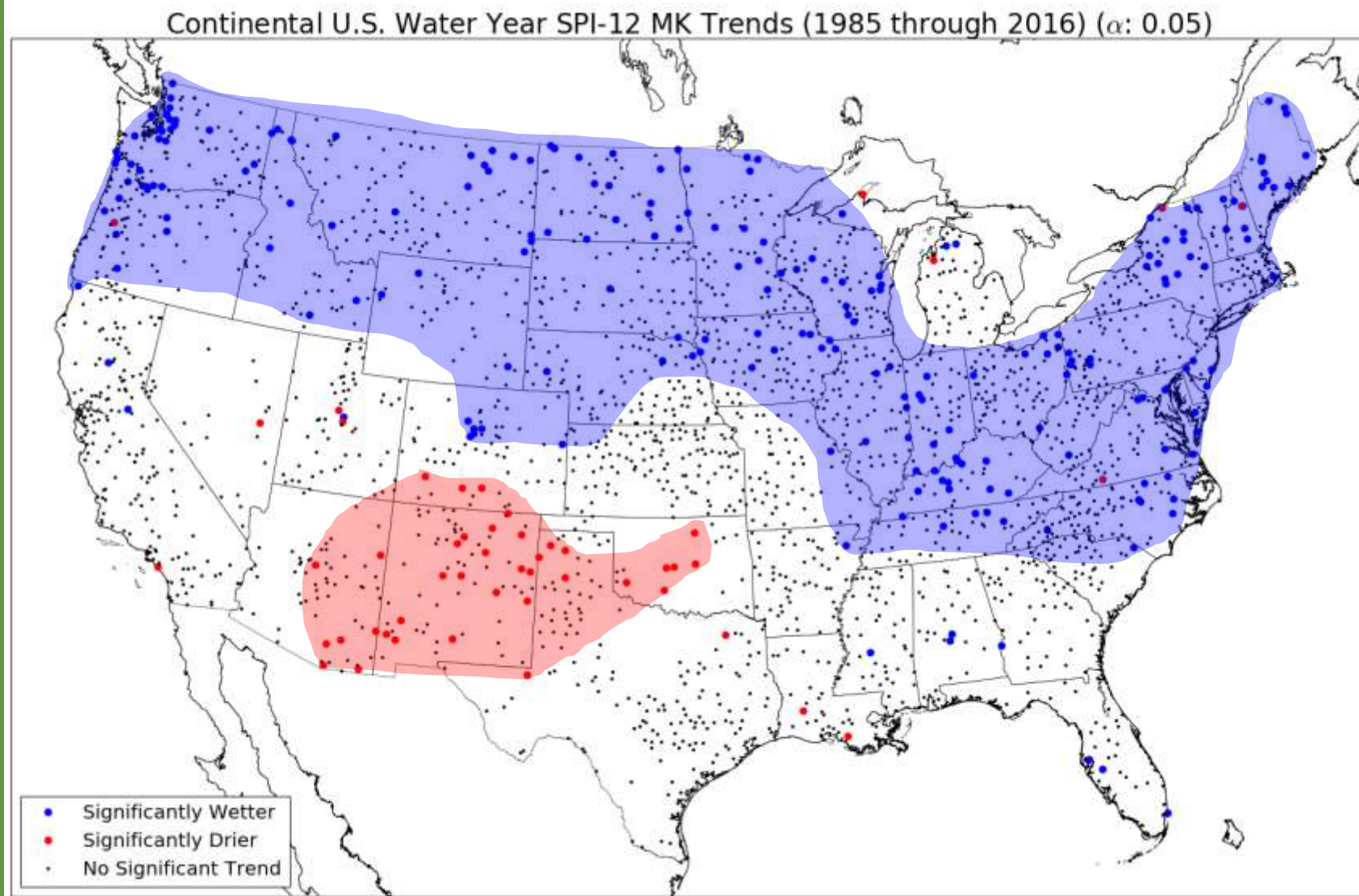
SPI-12 Water Year Trends 1980-2016

Two-tailed Mann-Kendall
Test, $\alpha = 0.05$



SPI-12 Water Year Trends 1985-2016

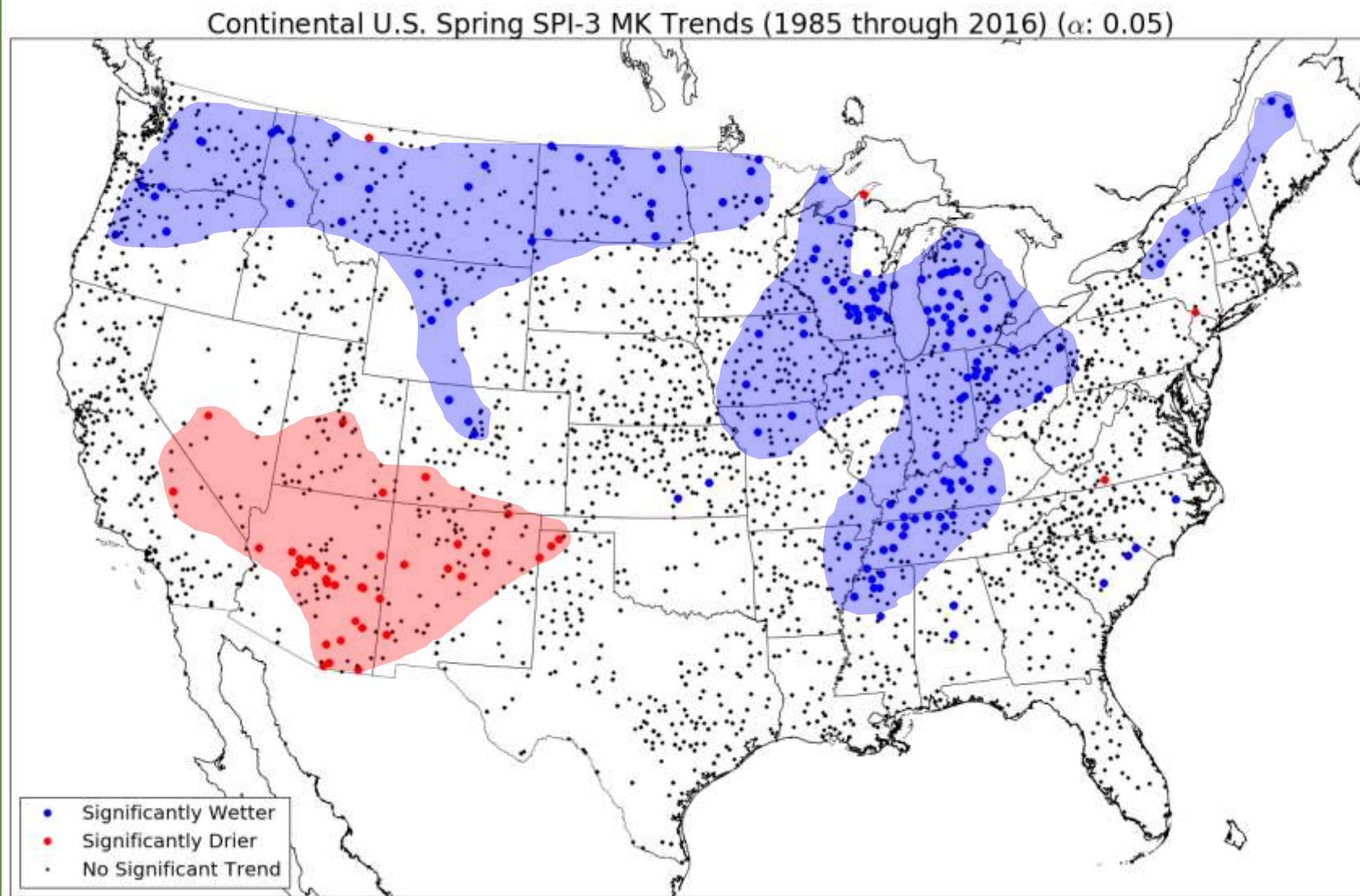
Two-tailed Mann-Kendall
Test, $\alpha = 0.05$



Seasonal Trends

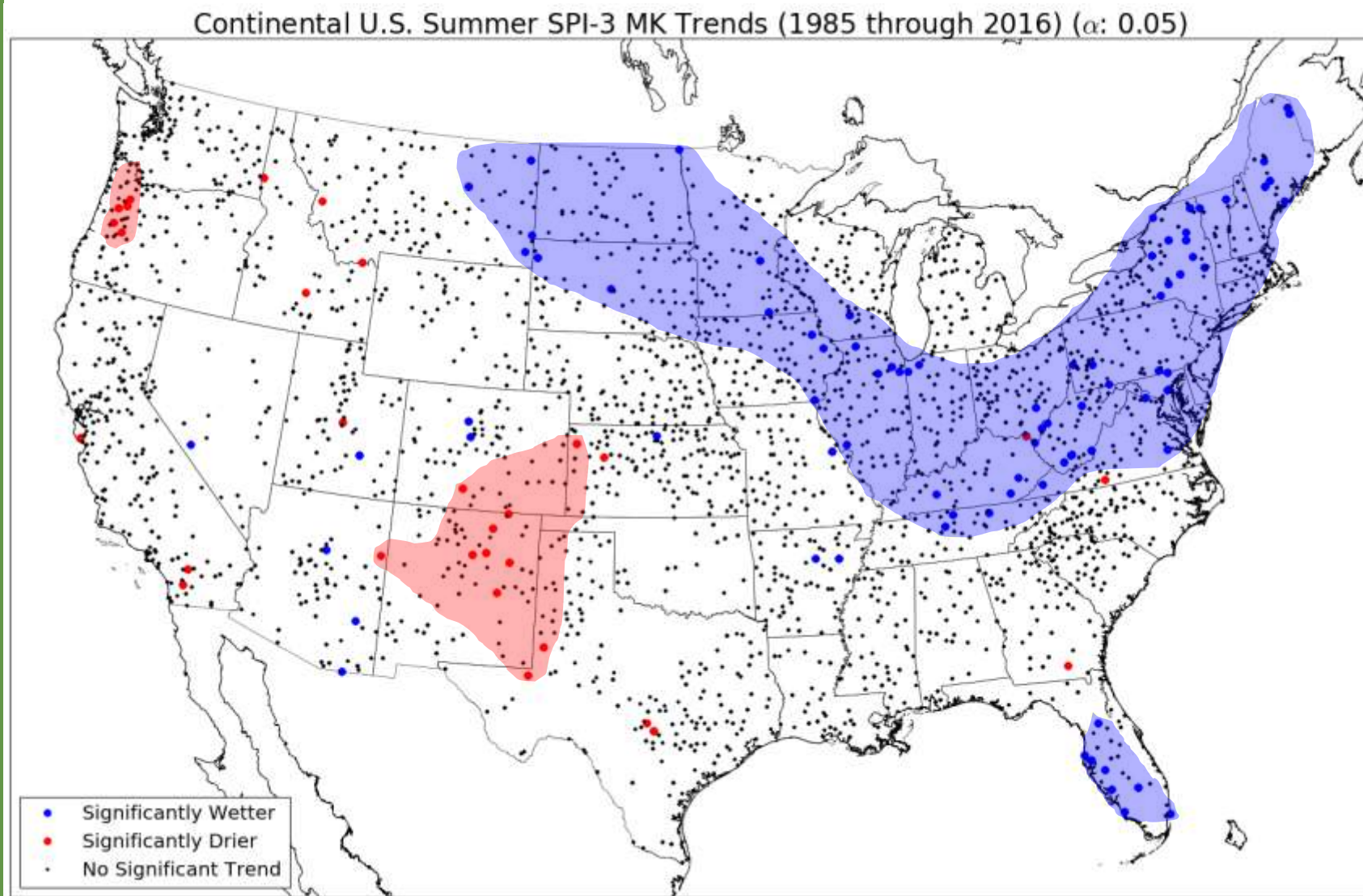
SPI-3 Spring Trends 1985- 2016

Two-tailed Mann-Kendall
Test, $\alpha = 0.05$



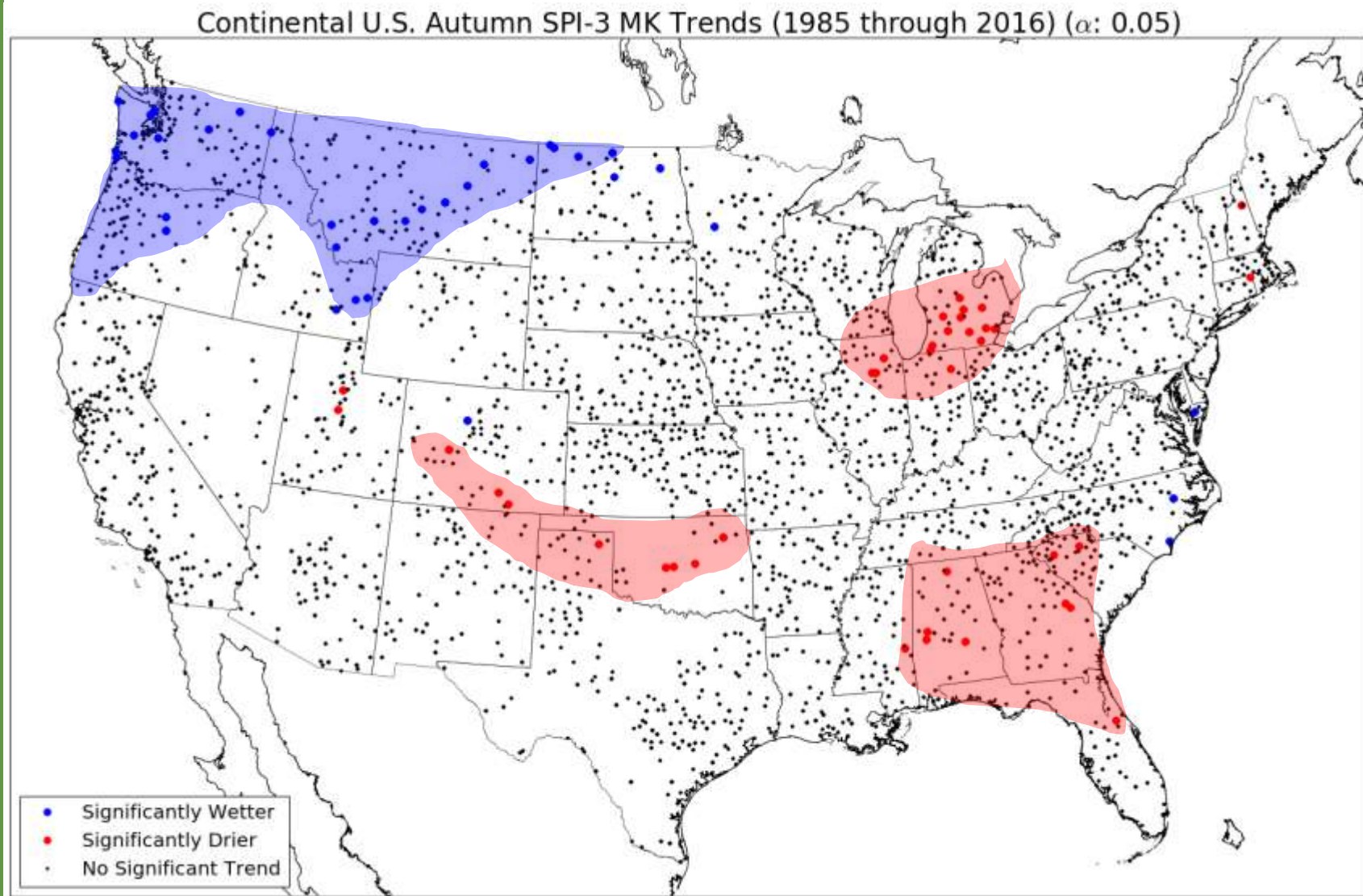
SPI-3 Summer Trends 1985- 2016

Two-tailed Mann-Kendall
Test, $\alpha = 0.05$



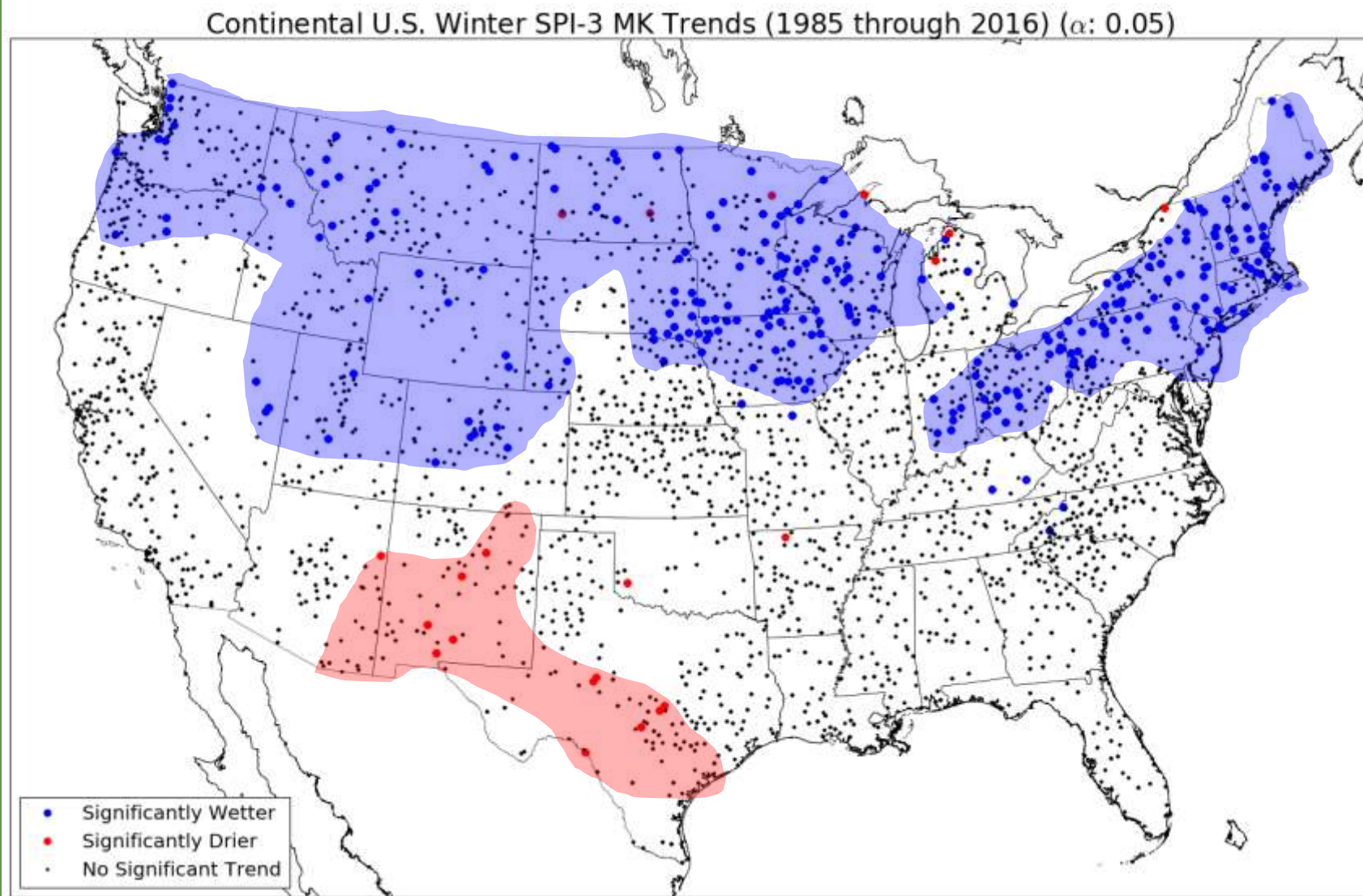
SPI-3 Autumn Trends 1985- 2016

Two-tailed Mann-Kendall
Test, $\alpha = 0.05$



SPI-3 Winter Trends 1985-2016

Two-tailed Mann-Kendall Test, $\alpha = 0.05$



Preliminary conclusions of trend analysis

- **General decrease in SPI in southwest CONUS last 30/35 years.**
- **Decreasing SPI in SW most prevalent in winter and spring.**
- **Consistent increasing SPI in northern CONUS (1930, 1950, and 1985 time scales); most prevalent in winter, spring, summer since 1985.**
- **Results can be very sensitive to choice of start year, especially for short time scales.**

Current and Future Work associated with the DRA

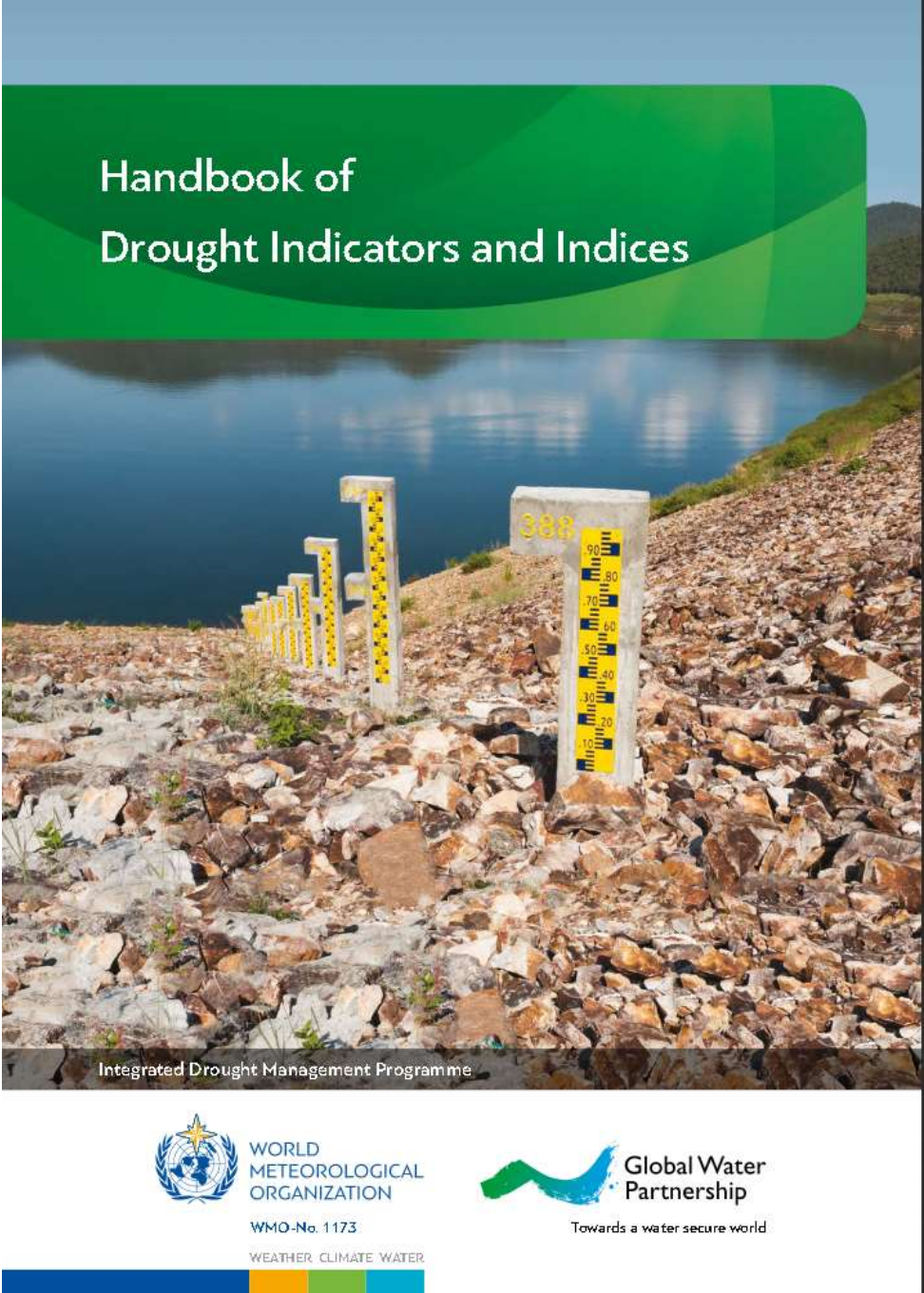
- ❖ The NDMC is currently updating all data and indices through 2017 and should be released publicly by the Summer of 2018
- ❖ Using historical streamflow data from USGS, a standardized streamflow index (SSI) has been calculated and a new “hydrology” tab will be developed for the DRA interface
- ❖ Trend analysis of the various drought indices is being conducted and will be included in the 2018 summer update of the DRA
- ❖ Interpolated maps will be created for all indices, currently they are available only for SPI
- ❖ Data for Alaska and Hawaii will be included (SPI index only) in the 2018 update
- ❖ Data for Puerto Rico and the U.S. Virgin Islands is being investigated for inclusion (SPI)
- ❖ Updating the DRA will become an annual event to keep the data and information the most up to date
- ❖ With the addition of new stations, the cluster analysis will be re-evaluated with the inclusion of the additional data

Handbook of Drought Indicators and Indices

https://library.wmo.int/pmb_ged/wmo_1173_en.pdf

<http://www.droughtmanagement.info/handbook-drought-indicators-and-indices/>

Handbook of Drought Indicators and Indices.
WMO/GWP Integrated Drought Management
Programme (IDMP). 2016. WMO-No. 1173. WMO,
Geneva, Switzerland and GWP, Stockholm, Sweden.





DROUGHT.UNL.EDU

e | ndmc@unl.edu

f /NationalDroughtMitigationCenter

@droughtcenter

Brian Fuchs
bfuchs2@unl.edu
402-472-6775

National Drought Mitigation Center
School of Natural Resources
University of Nebraska-Lincoln